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(54) EXCHANGE APPARATUS FOR HEAT AND/OR MASS EXCHANGE BETWEEN A GRANULAR MATERIAL AND A GASEOUS CURRENT

(57) An exchange apparatus (1) for heat and/or mass exchange between a granular material and a gaseous current comprises an exchange chamber (10) which is defined between a lateral wall (21) of a tubular body (2) and a central body (3) which is positioned inside the tubular body (2) and extends along a longitudinal central axis (20) of the tubular body (2). A first helical wing (4), which is fixed to the lateral wall (21) and projects towards the central body (3), and a second helical wing (5), which is fixed to the central body (3) and projects towards the lateral wall (21), are positioned in the exchange chamber (10). The two helical wings (4, 5) are inserted between each other and define at least one helical flow path between them for the gaseous current in the exchange chamber (10), putting an inlet (13) in communication with an outlet (14). The first helical wing (4) has an upper face (41) which is sloping down towards the central body (3), and its inner edge (43) is at a distance from the central body (3), so that a first helical passage (45) is defined between the first helical wing (4) and the central body (3) and is delimited underneath by the second helical wing (5). The second helical wing (5) has an upper face (51) which is sloping down towards the lateral wall (21) and its outer edge (53) is at a distance from the lateral wall (21), so that a second helical passage (55) is defined between the second helical wing (5) and the lateral wall (21) and is delimited underneath by the first helical wing (4). The upper face (41) of the first helical wing (4), the first helical passage (45), the upper face (51) of the second helical wing (5) and the second helical passage (55) define a drop path for the granular material in the exchange chamber (10) between a loading opening (11) and an unloading opening (12).

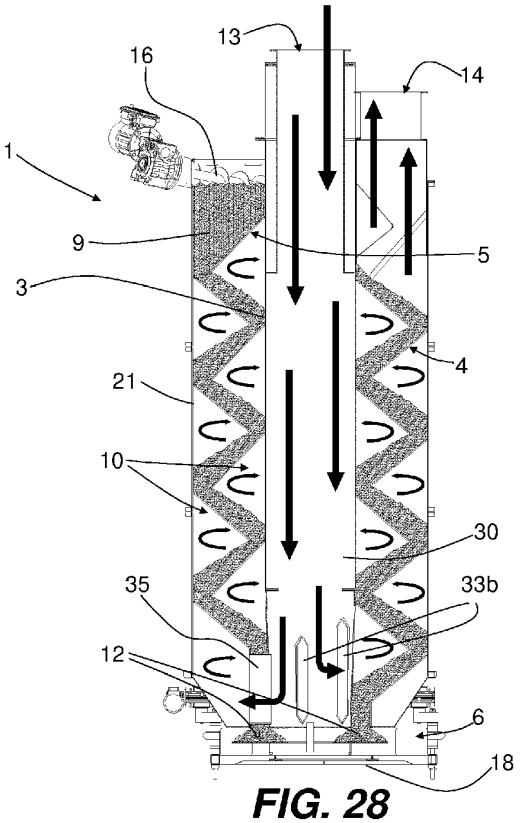

FIG. 28

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EUROPEAN SEARCH REPORT

Application Number
EP 22 17 8617

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A		4,5,7	F26B17/12 F27D3/00
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A		3-7	
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Y	US 2018/029915 A1 (HUBER AARON MORGAN [US]) 1 February 2018 (2018-02-01) * paragraphs [0034] - [0039]; figures 1, 2 *	10	
Y	US 3 837 092 A (MAYER O) 24 September 1974 (1974-09-24) * abstract; figures 1-4 *	3	TECHNICAL FIELDS SEARCHED (IPC)
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A	US 2014/041251 A1 (AYALA BARRETO FRANCISCO MARIA [BR]) 13 February 2014 (2014-02-13) * paragraphs [0034] - [0055]; figures 1-9 *	7	

~~The present search report has been drawn up for all claims~~

1

Place of search	Date of completion of the search	Examiner
Munich	5 October 2022	Leclaire, Thomas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-7, 10

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7, 10

heat exchange apparatus, characterized by its heat exchanging structure, and glass-making plant comprising same

1.1. claims: 2, 3

details of central body

1.2. claims: 4-7

details of helical wings, and lateral wall

1.3. claim: 10

glass-making plant

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2. claims: 8, 9

details of unloading means

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 17 8617

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82